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Twentieth Annual Symposium: Your Veterinarian and Your Dog

Twentieth Annual Symposium

The Twentieth Annual Symposium *Your Veterinarian and Your Dog* on January 27, 1990 featured four speakers discussing such diverse topics as canine dentistry, the role of endoscopy in small animal medicine, liver disease in dogs, and Lyme disease.

Canine Dentistry

The first speaker, Dr. Colin E. Harvey, professor of surgery, provided an overview of canine dentistry. Because periodontal disease had been covered in a previous symposium the talk dealt with normal and abnormal canine dentition and trauma.

The dog has 28 deciduous ('baby') teeth and 42 permanent teeth. The deciduous teeth erupt in the first few weeks after birth, and are smaller, narrower and sharper than the permanent teeth — no wonder that we all get scratched by the teeth of playful puppies! The deciduous teeth are lost during chewing when the puppy is 3–6 months old — they are pushed out by the permanent teeth that are developing beneath them.

The upper jaw has 10 permanent teeth on each side including the large canine and carnassial teeth. The lower jaw has 11 teeth on each side. In the front of each jaw, between the very long canine teeth, are the six small incisor teeth. When the jaws are closed together in a dog with a 'normal' bite (also called a 'scissors' bite), the lower canine tooth lies between the upper canine and corner incisor teeth, the upper incisor tooth tips lie slightly outside the lower incisor tooth tips and the lower carnassial tooth lies inside and just behind the upper carnassial tooth.

The gums normally are a light pink color, or may have black pigment. The palate tissue between the upper teeth is ridged. The tongue is very long, and covered by soft short projections ('papillae') some of which form part of the taste mechanism. The inside lining of the cheeks is light pink or black in color, and normally slightly moist and glistening.

Compared to the primitive dog, such as the wolf, few dogs have a normal occlusion (the pattern in which the teeth fit together when the mouth is closed, and which determines how effective the teeth are when called on to hold or tear). There is a lot of confusion over the terms 'over-bite' and 'under-bite'; because of this I prefer not to use these terms, but to look at the jaws as a unit to see what the arrangement is. The genes that control how long the upper and lower jaws will be are independent of each other. Many breeds, such as bulldogs, pugs, Boston terriers, Pekingese, are brachycephalic (short-faced due to a congenital defect of the bones of the base of the skull); in these dogs, the lower jaw (mandible) usually is normal and the upper jaw is excessively short. In some other breeds with very long (dolichocephalic) skulls, the lower jaw may still be normal, but is too short to fit properly with the abnormally long upper jaw. In general, an excessively short lower jaw is rare.

In most instances, jaw length abnormalities do not cause problems that affect the health of the dog (though there will be less effective cleansing of the teeth during chewing, and gum disease may develop more rapidly than would otherwise be the case). Having less than the usual 42 teeth is common in dogs, particularly the toy breeds; occasionally, there are more teeth than normal; neither of these conditions affects the health of the dog.

Since orthodontic correction is not ethical unless the animal's health is suffering, such procedures are rare; animals with congenital abnormalities severe enough to require orthodontic treatment or extraction because of malocclusion should be neutered.

One of the most common inherited problems is retention of the deciduous teeth, seen most often in toy breed dogs, due to the short length of the jaw preventing the developing permanent tooth from pushing against the root of the deciduous tooth. This can lead to problems in the way that the upper and lower canine teeth fit together, because the normal scissors bite that interlocks the upper and lower jaws is not present to guide subsequent development of the jaws and teeth. Because of these potential effects on further development of the permanent teeth, and the likelihood of build-up of plaque and debris between the permanent teeth and adjacent deciduous teeth, the usual veterinary recommendation is to extract the deciduous tooth as soon as it is obvious from the eruption pathway of the permanent tooth that the deciduous tooth will be retained — simply put, there should not be two sets of erupted teeth in the mouth at the same time.

Another problem is 'medially displaced lower canine teeth' where the lower canine teeth do not erupt at the normal angle to each other, and one or both is/are then caught inside the upper canine tooth; the effect is that the lower tooth will push into the palate tissue or gum tissue just inside the upper tooth and may cause ulceration and bleeding; this problem is usually correctable (using an orthodontic screw or activated wire system between the lower canine teeth, or an inclined plane bonded against the upper canine teeth).

A third common orthodontic abnormality is 'level bite', where the tips of the upper and lower incisor teeth meet when the jaws are closed; this should never be accepted as a normal bite in the show ring, because the effect is to put the incisor teeth under abnormal pressure, causing excessive wear, or even fracture.

A fourth abnormality is 'anterior cross bite', where the tip of one or more lower incisor teeth is positioned outside the upper incisor teeth when the jaws are closed. This is a particularly easy abnormality to spot, occurring as it does at the very front of the mouth. The health of the dog is not affected, and treatment is not ethical. 'Posterior cross bite' is much less common — in this condition, the lower carnassial (first molar) tooth lies outside the upper carnassial (fourth premolar) tooth.

Tooth decay (caries) is much less common in dogs than it is in humans. Most irregularities in the shape or coloration of the surface of the teeth of dogs are not caries cavities. 'Enamel hypoplasia' results from a disturbance in the health of the puppy at 2–3 months of age when the crown of the tooth is being formed deep within the jaw bone; fortunately, now that distemper vaccines are so available and effective, this condition is rare. The most common cause of surface discoloration is staining of cracks and crevices from plaque accumulation.

Trauma is a common cause of oral disease, resulting in injuries such as fracture of the jaw or dislocation of the temporo-mandibular joint in some dogs. There are many successful techniques for management of these problems.

Teeth are fractured frequently in dogs, most commonly the incisor, canine, or upper carnassial teeth. The need for treatment is based on whether the pulp of the tooth is exposed — if it is, the blood vessels and nerve tissue inside of the tooth will die and eventually the bone around the root will be weakened as a result of an abscess developing from the tip of the root. This can be prevented by root canal (endodontic) treatment and restoration; depending on the size and position of the tooth (and therefore the pressure that the tooth will have to withstand when it is closed forcefully against its opposite number) one of several techniques can be used. Some can be performed during a single anesthetic episode, whereas others, such as replacement with a very strong steel crown in a working police dog, require a minimum of two anesthetic episodes.

Other abnormalities found include tumors, some of which are malignant. Surgical resection can be used successfully to treat benign and some malignant tumors, and radiation therapy is beneficial for others.

With conscientious care, and periodic visits to your veterinarian for examination, it is possible for you to keep your dog's teeth in excellent condition. The alternative is to ignore the problems that develop, with unfortunate consequences for your dog.

Penn's veterinary dentistry program has a lot of firsts: the only full-time clinician in a veterinary dentistry service; the first dental residency program; and the first full-time dental hygienist at a Veterinary School. Penn's veterinary dentistry program is integrated with the surgery program and students rotate through the dentistry clinic.

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Brushing Teeth to Prevent Periodontal Disease

Prevention and treatment of gum disease is best managed as a joint effort between your veterinarian and yourself, and should start when the dog is young.

Tooth brushing daily is very effective if the dog learns to cooperate. A soft child's tooth brush (infant size) is used — if you have several dogs, use a separate brush for each dog. The toy breeds may be too small to permit use of a brush — use a cotton tipped swab instead. Use of a palatable oral rinse solution or dentifrice applied with the brush helps to gain the cooperation of the dog. The younger the dog when brush is started, the more cooperative the dog is likely to be. Human dentifrices are not recommended because of the foam they produce.

If you are not currently brushing your dog's teeth and are willing to give it a try, I suggest that you start gradually. Gently hold the mouth closed by circling the muzzle and lower jaw with the fingers and thumb of one hand, then with the other hand, start by brushing only the outside surface of the front teeth. This will get the dog used to the sensation of being brushed and the taste of the brushing material that you are using, without being worried that the brush will be shoved down his/her throat. After a few days of brushing the outside of the front teeth only, move to the next stage by gently sliding the brush into the pouch of the cheek so as to brush the outside surface of the teeth in the back of the mouth. After a few more days, and if the dog is still cooperating with you, move to the final step, which is to use the finger and thumb of one hand to pull up on the upper jaw so as to open the mouth, thus allowing the brush to reach the inside surfaces of the teeth. To be of long-term value, brushing must be done regularly — daily is better than every other day, and brushing less than once a week is of little or no value.

C.H.

Lyme Disease

Recently a great deal of concern has been expressed about Lyme disease. Dr. Meryl P. Littman, assistant professor of medicine, discussed symptoms and treatment of the disease in the dog. It is not a new disease, and it is not confined to the United States. First described in man in 1909 in Sweden, it can be found in Europe, Asia, and Australia. Its cause, a spirochete, was not suspected until the 1930's. It took, however, until the 70's and 80's when it was finally proven that a spirochete was the cause of the disease and that it was transmitted by ticks to people and animals.

The spirochete, *Borrelia burgdorferi*, is found primarily in the deer tick (*Ixodes dammini*), but the organism has been isolated from other biting insects, flies, mosquitoes, and fleas, and it has been isolated from the urine, blood, and milk of animals infected with the organism. The deer tick feeds on small rodents, birds, and other animals, including man.

Larva, nymph, adult male, and adult female of Ixodes dammini on ruler scale (about seven times actual size). Photo courtesy of Pfizer.

In its development, the tick passes through three stages. As 6-legged tiny larvae, the ticks feed once in the spring/summer, usually on mice, then molt and emerge during the following spring as 8-legged, pin-head sized nymphs. These feed once for about three to four days, fall off and molt, to emerge as adults in the fall. The adults feed and also reproduce. A new generation begins the cycle again in the spring/summer. Larvae are found on higher vegetation, thus reaching larger hosts.

When the tick feeds, it transmits the spirochete to the host. But transmission of the disease can also occur through contact with urine, milk, or blood through intact skin. Thus our doctors, nurses and students should wear gloves when collecting urine from our patients.

Initially, in most people, Lyme disease causes a circular rash at the tick bite site, sometimes accompanied by flu-like symptoms and a feeling of general malaise. These symptoms appear about 1 - 3 weeks after the bite and last from 3 days to 16 weeks. However, not all people bitten by an infected tick exhibit the rash or the other symptoms. The rash may fade, only to reappear at a later date at a different site if one is not treated with antibiotics. Months after infection, people may show signs of arthritis, neurological and/or cardiac disease. In some human cases there may be a facial palsy. If the pattern is not treated, the disease can become chronic and affect many organ systems.

Dogs do not exhibit the rash, thus the owner has no early indication that the animal may have become infected by the spirochete. First signs that something is amiss often include intermittent lameness that may shift from limb to limb. Later, months after the initial infection, dogs rarely may have cardiac signs. The animal may be sick or lame intermittently and not on a continuous basis. In dogs, it is suspected that Lyme disease may cause glomerulonephritis and protein may be lost through the urine. This has not been seen in people.

Because Lyme disease can manifest itself in such a variety of ways, diagnosis can be difficult. An antibody titer at the beginning of the infection may be inconclusive and it may be necessary to repeat the test in 2 - 4 weeks. The best way to confirm the diagnosis is to isolate the spirochete from joint fluid, blood, or urine from the patient. Treatment consists of large doses of antibiotics. Most of the time these are given orally, however, in severe chronic human cases, antibiotics may have to be given intravenously.

A positive antibody titer against the spirochete does not mean that a dog has the disease or will show signs later on. During a study of dogs in shelters in the Delaware Valley, it was found that about 20% of the dogs in the Philadelphia shelters, 40% of the dogs in the Delaware County shelter, and 25% of the dogs in the Chester County shelter, had positive titers, yet they showed no signs of the disease. Some animals may be able to overcome the spirochete infection or become carriers without illness. Dogs that were experimentally infected at North Carolina State University were shown to seroconvert (had positive antibody titer) but did not show clinical signs of disease.

Prevention of Lyme disease can be difficult. Tick control procedures must be used. Scientists are now working to control the organism with a tiny parasitoid wasp which lays eggs inside ticks. This reduces the number of spirochetes in the tick.

Diagnostic and Therapeutic Endoscopy in Small Animal Medicine

Dr. Robert J. Washabau, assistant professor of medicine, discussed endoscopy and its applications in small animal medicine. Historically, rigid tubes were first used by physicians to perform endoscopy on human patients. It wasn't until the 1950's and the advent of fiberoptics that endoscopy became a viable diagnostic tool in human and animal medicine.

Endoscopy permits the clinician to view the lumen of the gastrointestinal tract without surgery. The endoscope tube is a long, slender, flexible tube that is inserted through the mouth into the gastrointestinal tract. This tube contains bundles of optic fibers which transmit the image seen through the objective lens at the tip of the endoscope to a magnifying lens at the top of the instrument. The tube also contains channels for the passage of biopsy instruments, air or water insufflation, and suction. One channel also contains a light-transmitting fiber bundle to provide illumination of the gastrointestinal tract. The tip of the endoscope can be deflected, up, down, or sideways, allowing a complete visual survey of the site being examined. The endoscopic tube is connected by an "umbilical" cord to a machine housing the power and light sources, air and water pumps, as well as a suction device.

A bone fragment being removed from a dog's esophagus with the help of endoscopic equipment.

The endoscope at VHUP is equipped with a camera that allows transmission of images to a VCR for recording purposes and to a television screen for viewing. It is an excellent teaching tool as students may view the procedure while it is in progress and video tapes can be produced for teaching purposes.

Prior to deciding to use endoscopy for diagnostic or treatment purposes, radiographs are taken and ultrasonography is sometimes utilized to determine the cause of disorder. Only then does the clinician decide whether to use endoscopy or surgery for diagnostic or treatment purposes.

The endoscope may be utilized to examine the esophagus, stomach, small or large intestine. It allows the clinician to observe these structures and to obtain biopsies or fluid samples if needed. It may also be used to remove foreign bodies from the esophagus, stomach or trachea, and to place feeding tubes in animals in need of nutritional support.

While endoscopy is much less invasive than surgery, there are still risks involved when treating small animal patients. The dog or cat must be anesthetized to prevent chewing of the endoscope tube. Human patients usually are only sedated.

The laparoscope is a smaller endoscope and an instrument used for examination of the abdominal and internal organs without major surgery. It can be employed to obtain tissue samples and biopsies from the liver, kidneys or other abdominal structures.

Endoscopy offers the clinician an alternative to surgery as it is less stressful and less costly. It is not without risks though as full anesthesia is required.

Dr. Washabau had an AKC fellowship in gastroenterology and the endoscopic equipment was purchased through the generosity of the Kennel Club of Philadelphia.

Liver Disease

Dr. Jerry R. Waddle, lecturer in medicine, discussed liver diseases in dogs. The liver, the largest gland in the body, serves a multitude of vital functions. In the dog it is located centrally behind the diaphragm, in front of the stomach and just underneath the last rib. The liver has four lobes, and the gallbladder is between two of these on the right side of the body. The bile duct connects the gallbladder to the small intestine so that bile can be excreted into the intestine.

The liver is richly supplied with blood from two main sources; the hepatic artery carries oxygenated blood pumped from the heart to the liver, and the portal vein drains nutrient-rich blood from the intestines and other abdominal organs into the liver.

Several vital proteins, including albumin and clotting factors, are produced by the liver. Albumin regulates the fluid balance within tissues, and clotting factors prevent bleeding. Bile acids also originate in the liver and are stored in the gallbladder. Without bile, fats could not be absorbed easily by the body. The liver's metabolic function is most important, here carbohydrates are converted to glucose to be stored and utilized later to meet energy requirements; proteins and fats are broken down and converted into other substances. The organ also removes toxins, waste products, and bacteria from the blood. In addition, the liver stores minerals and vitamins and is an additional site where red blood cells are

produced. Dr. Waddle pointed out that the liver is quite large, and that one can function even if part of it is damaged.

When the liver is diseased and does not function normally a spectrum of clinical signs can result. Among them are anorexia, nausea and vomiting due to the build up of toxins which are not adequately eliminated by the liver. In severe cases, liver dysfunction can result in stupor, coma, disorientation, blindness and seizures. Jaundice develops when billirubin, the breakdown product of hemoglobin, accumulates in the blood instead of being metabolized by the liver. Liver disease can also cause fluid build-up, particularly in the abdomen, due to a reduction in albumin production and increase pressure in the portal circulation. If the albumin is low, fluids will leak from blood vessels and accumulate in tissues and the abdominal cavity.

When liver disease is suspected, a number of tests will help the clinician to determine whether the liver is the primary problem or whether it is affected by disease of another organ. General blood tests will give the veterinarian information about the level of liver enzymes, bilirubin, albumin, glucose, cholesterol, and the clotting factors. However, such tests are not liver function specific. To determine how the organ functions additional tests are needed to determine whether BSP, a dye, is cleared from the bloodstream, whether bile acids are cleared normally from the blood, and how quickly ammonia can be cleared from the system. In addition, radiographs and ultrasound of the abdomen may detect changes in liver size or structure. A biopsy is most often needed for a specific diagnosis.

A common problem, seen in young dogs, is the vascular shunt. Here a connection exists between the vena cava and the portal vein. Blood from the portal vein bypasses the liver, depriving the organ of nutrients. If the shunt occurs outside the liver, there is a good chance that it can be repaired. However, if the dog has multiple shunts or if they are within the liver, the prognosis for repair is poor. The signs seen in affected pups are loss of appetite, vomiting, and diarrhea. If these animals are treated early, before too much damage to the liver has occurred, the prognosis is good. The shunts appear with higher frequency in Yorkshire terriers and miniature schnauzers.

There are a number of drugs which are toxic to the liver, such as anti-convulsants which have a cumulative effect, halothane, anti-parasitic drugs, sulfonamides, ketoconazole, and, in some cases, tetracyclines. It is always best to check with the veterinarian before administering any drug. Chemicals like arsenic, chlordane, carbon tetrachloride and others are also liver toxins. A number of biological substances, infectious and parasitic agents as well as bacterial, viral, fungal and protozoal organisms can be toxic to the liver. Liver function is also affected by acute pancreatitis, acute hemolytic anemia, heat stroke, surgical hypotension or hypoxia (low blood oxygen), trauma and inflammatory bowel disease.

Chronic active hepatitis is a disease of the liver recognized in several breeds of dogs including Doberman pinschers. In Dobermans, the disease is more commonly seen in middle-aged females. These dogs have clinical signs of chronic liver disease and a liver biopsy shows scarring and ongoing liver damage. Copper levels are increased in the liver. There is no cure, and treatment is supportive. The cause of the disease is not known. West highland white terriers may also afflicted by a chronic liver disease with elevated copper levels in their liver. In Bedlington terriers, a liver disease caused by progressive copper accumulation has been shown to be a hereditary disease.

Liver cancer is another liver disorder affecting dogs. It often is metastatic having its origin in cancer of the mammary glands, spleen, lymphnodes, etc. There is also a primary hepatocellular carcinoma which originates in the liver.

Treatment of liver disease is often difficult. If the liver is affected due to disease of another organ, treating the primary cause often will be enough. If the liver is the primary site, supportive therapy such as IV fluids, antibiotics, a low protein diet, and sometimes plasma transfusions are used in treatment.

Dr. Waddle explained, "while we know a lot about the liver and its function, there is much which needs to be studied so that the treatment of liver disease can be improved".

Emergency Service at New Bolton Center

Large animal medical and surgical emergencies often occur when the veterinarian is gone for the day. After-hour-emergency clinics, staffed by clinicians with a specific interest in emergency veterinary medicine, are not commonly available to large animal owners. Now the George D. Widener Hospital for Large Animals at Penn's New Bolton Center campus has an emergency clinician on duty every night from 6 p.m. to 6 a.m.; in the past the hospital provided emergency service staffed by a rotation of residents and clinical faculty on call.

The emergency duty performed on a rotating basis could be demanding on the residents and clinicians who were required to put in a full day's work prior to and following their nightly emergency shift. The potential existed for an individual to be working for 36 hours during the week and even longer on the weekends. Now there are two people, Dr. Yves Rossier and Dr. Janet Johnston who handle the majority of the emergency cases during the night and weekend.

Patients admitted during the night benefit from the presence of the emergency service clinicians. Both clinicians have completed residency training and are primarily interested in emergency and critical care medicine. They are experienced in making critical care decisions unlike many other school's emergency systems where an intern is usually on first call. This is particularly important in colic cases, where early intervention can improve the outcome. The hope is that if surgery is required, a decision can be made rapidly, the animal stabilized and under general anesthesia more quickly than in the previous system. In addition, if a specialist is required for orthopedic surgery, for example, the animal can be stabilized and prepared quickly while the specialist is on his way. The emergency clinicians can perform ultrasound and radiographic exams and they have the 24-hour support of the laboratories for blood tests and other necessary diagnostic work-ups. A nursing staff is present as well as a resident.

"We handle any emergency, whether it is a hospital patient or a patient being brought in," said Dr. Rossier. "We are also available for phone consultations with practitioners and large animal owners if an emergency arises." The questions vary from what to do with a calf with diarrhea to colic and other life-threatening situations.

The patient coming in may be a bovine with a broken leg, a sheep with neurologic disease or a horse with colic. There may be hospital patients needing prompt attention and treatment. "We monitor the hospital cases during the night and provide emergency treatments if the need arises," said Dr. Johnston. "No longer will the attending clinician have to come in the middle of the night. We take care of the immediate problem and then brief the clinician in the morning." During the foaling season a separate staff is on call for those patients.

When the Connelly Intensive Care Unit opens in May, the emergency service will be further enhanced as critically ill animals can be admitted directly to the intensive care unit for stabilization, treatment and monitoring.

The emergency service has augumented operations at the Widener Hospital and has helped make the off hours management of cases an easier task for all involved. A team approach directed at providing continuity of the support services for each case from admission through surgery and postoperative care is the goal. A teaching program is also in the future plans. Both clinicians are very excited about the service. "As veterinarians and animal owners in the area become more aware of the service," said Dr. Rossier, "the service will be even more in demand." Currently the Widener Hospital handles about 800 emergency cases annually, this includes patients admitted during the day. These patients are handled by a rotating team of clinicians.

Dr. Johnston is a graduate of the College of Veterinary Medicine, The Ohio State University. She is Board Certified in Internal Medicine and has completed a residency in surgery, being board eligible in 1991. Dr. Rossier is a graduate of the School of Veterinary Medicine, University of Montreal and has completed a residency in internal medicine and is also board eligible.